Session 1

Status of Office Surface Mining/State Reforestation Efforts

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State Statistics on Eastern U.S. Tree Planting Efforts
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State Statistics on Western U.S. Tree Planting Efforts
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Scott Boyce, Office Surface Mining, Washington, D.C.

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STATE STATISTICS ON EASTERN U.S. TREE PLANTING EFFORTS

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Eastern State Survey

In preparation for these discussions on reforestation, the Interstate Mining Compact prepared a survey to determine the state of knowledge concerning the planting of trees on both active and abandoned coal mined lands. Please keep in mind that the following data represents a very rough estimate at this point. Some were based on real data but many are best estimates based on personal experience.

Abandoned Mine Land (AML) Survey Results

Figure 1 illustrates the percent of forest land use in each of the eastern states. Alabama, Tennessee, Kentucky, Virginia, and Maryland have a large percentage of mined land planted to a forest land use. It must be understood that the acreage may not be large on a lot of these project sites. Percentagewise reforestation has been a large part of the eastern states' AML reclamation. In some other states like Indiana, we are looking at going back to sites that have been previously stabilized with grasses and replanting them with trees. Based on the best estimates produced by this survey, it appears that there are about 32,000 acres (Figure 2); 16 million (Figure 3) trees have been planted on eastern U.S. abandoned mined land sites. Alabama appears to be the leading planter of trees on AML sites.

The cost for planting these trees is estimated at $200 to $700 per acre above that amount required to establish a grass cover. It was closer to the $200 amount in the appalachian states. In the mid-continent states, the costs were higher with the exception of Texas where planting with trees is less expensive than managing for coastal burmuda grass.

In all of the eastern states, survival of trees is being achieved. In the appalachian states, tree growth is reported as poor primarily due to compaction. In the mid-continent states, growth rates are unknown, and it is suspected that compaction is a problem in terms of limiting productivity. Estimates ranged from poor to good. In the appalachian states, there is a tendency to look at forestry and wildlife habitat as a combined land use, whereas in the mid-continent states there are distinctly different land uses.

The survey indicated that a lot of the eastern states would support policy and rule changes that would increase flexibility for wildlife habitat and in the area of bond release. They would strongly support technology exchange and landowner education. The mid-continent states endorsed tree initiatives provided that soil capability requirements are not compromised. It was noted that in many cases, landowners did not want trees because they will be using the land primarily for agriculture and livestock. Compaction is an issue if you want to restore productivity. Many of the mid-continent states have limited AML funds and would plant more trees if additional funding for that purpose was made available.

Active Mining Survey Results

In the appalachian states, with the exception of Virginia and Maryland, there was a decrease of forest land use after mining (Figure 4). Ohio showed the largest reduction from 40 percent forested land use prior to mining to 5 percent after mining. Ohio believes that landowners in that state see mining as an opportunity to get their land cleared of trees so that it can be used for agriculture. Maryland requires that anything reclaimed with over a 12 degree slope must be put back to trees.

In the mid-continent states, there are loses in forest land use for the major coal producing states of Indiana and

Illinois with the exception of Texas (Figure 5). Both Texas and Alabama show a significant increase. However, there is an incentive to plant areas with trees for wildlife habitat as you only need to plant 250 trees per acre rather than the 450 trees per acre required for forest land use. The states of Indiana, Illinois, and Alabama all show a significant increase in percentage of land planted with trees for wildlife habitat (Figure 6).

Based on the data received, I would estimate that there have been 400 million trees planted in Kentucky alone (Figure 7) even though there has been a loss of 250,000 acres of forest land use. This large number of trees planted shows that the effort at tree planting has been substantial. I assumed that West Virginia planted half as many trees as Kentucky and came up with the figure of 200 million trees planted there. This means that there has been roughly over one half billion trees planted on reclaimed sites in the eastern United States.

Summary

In the mid-continent states, four out of twelve states showed an overall increase in forest acreage after mining. Four states showed acreage decreases after mining of greater than 10 percent. All major coal producing states showed an increase in reclaimed land planted to trees when you include both forestry and wildlife land uses. In the appalachian states, one state showed an increase in forest acreage after mining and three states showed a greater than 20 percent decrease. One state showed a 10 percent decrease. Compaction was noted as the major limitation to tree productivity in all states.

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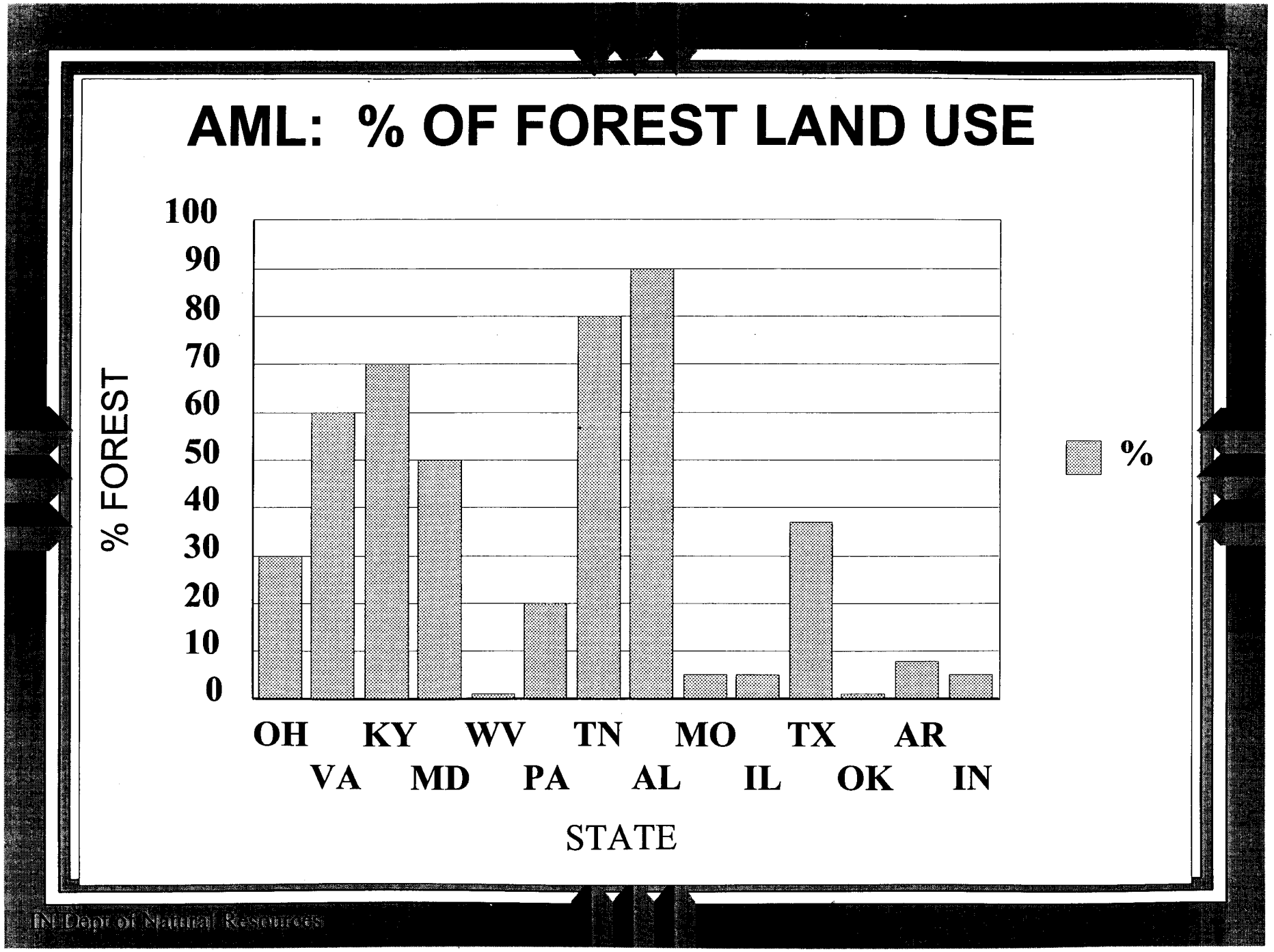

AML: % OF FOREST LAND USE
100
90
80
70
60
50
40
30
20
10
0
% FOREST
%
OH
KY
WV
TN
MO
TX
AR
VA
MD
PA
AL
IL
OK
IN
STATE
TN Dept of Natural Resources

Figure 1

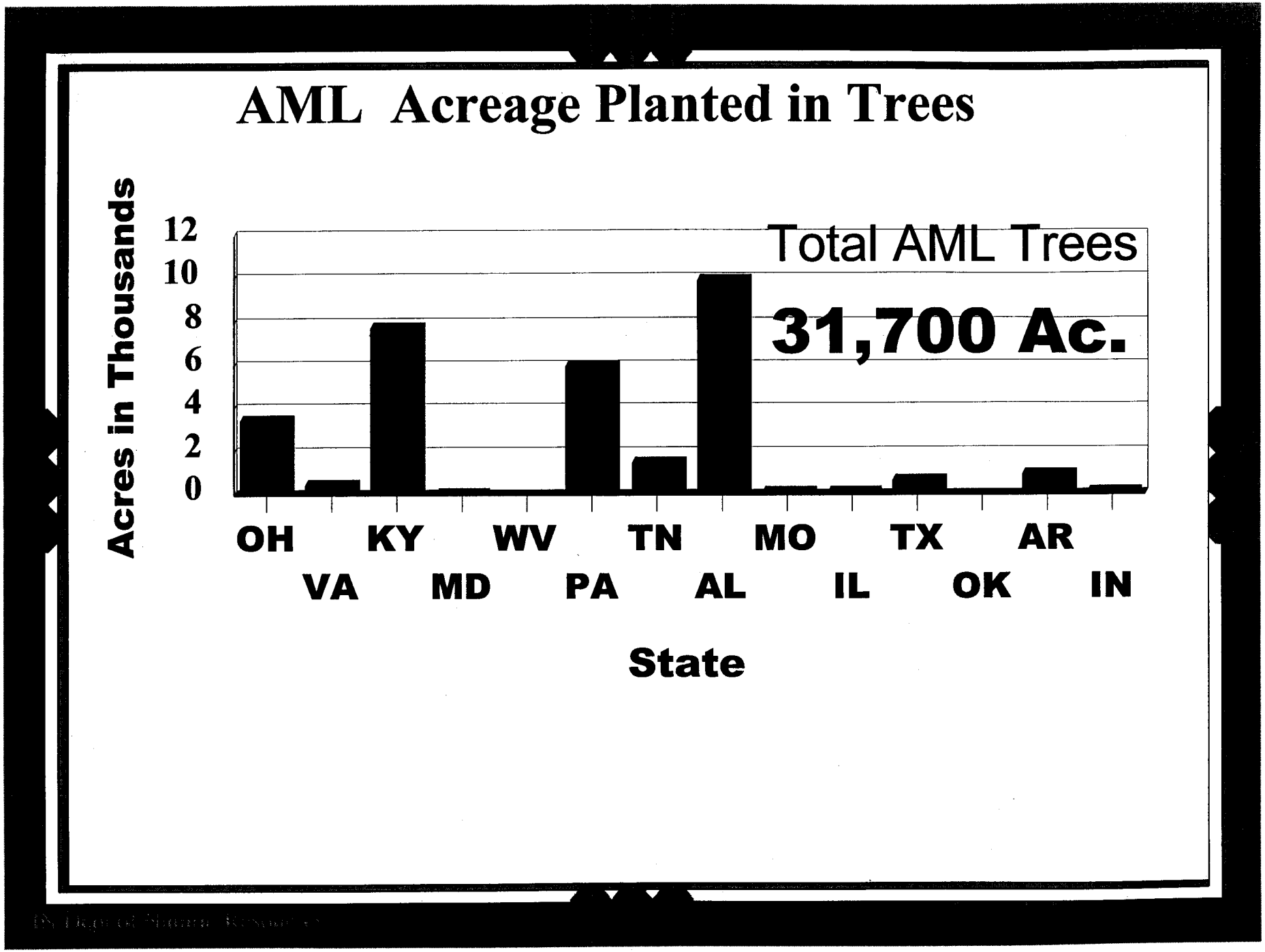

AML Acreage Planted in Trees
Acres in Thousands
12
10
8
6
4
2
0
Total AML Trees
31,700 Ac.
OH
VA
KY
MD
WV
PA
TN
AL
MO
IL
TX
OK
AR
IN
State

Figure 2

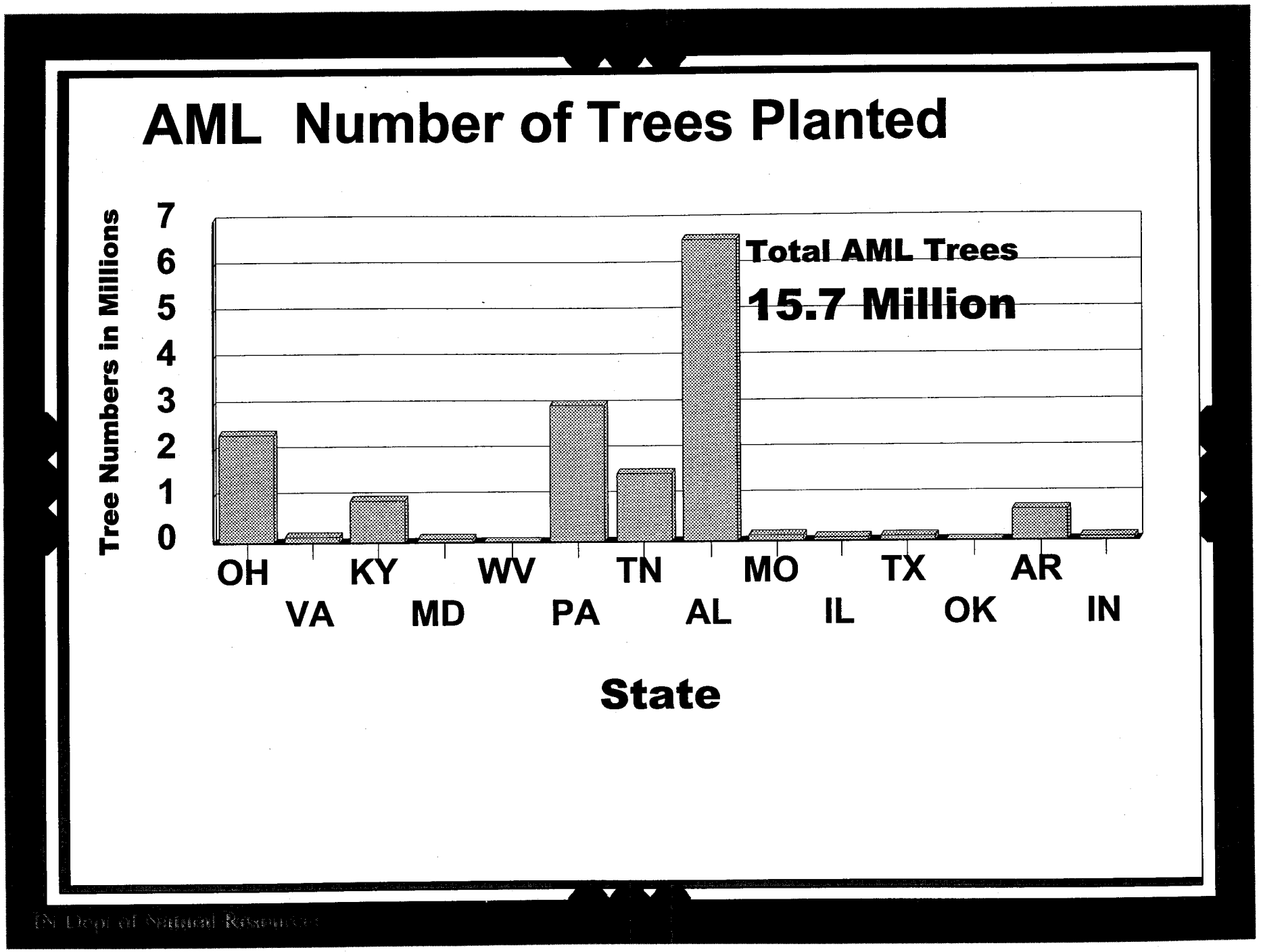
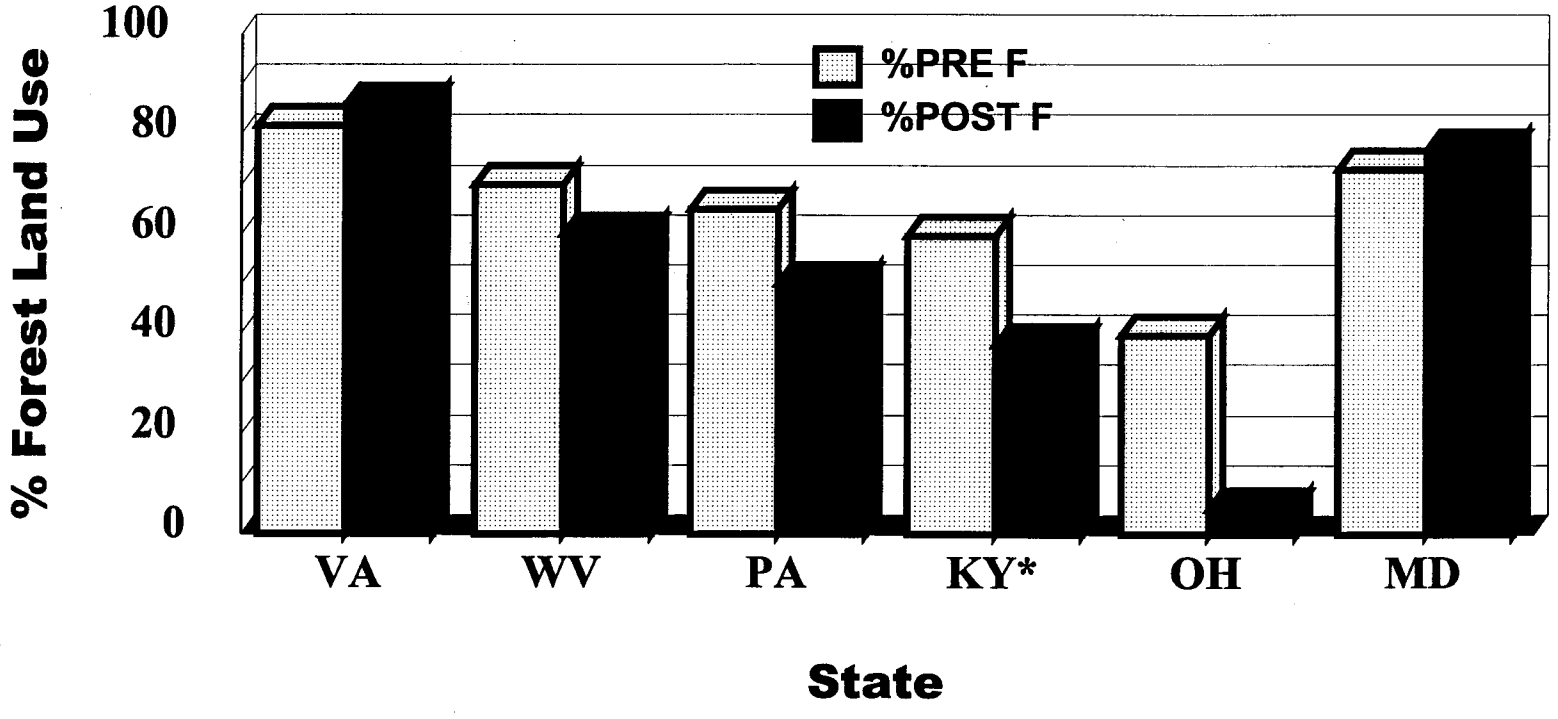

AML Number of Trees Planted
Tree Numbers in Millions
7
6
5
4
3
2
1
0
Total AML Trees
15.7 Million
OH
VA
KY
MD
WV
PA
TN
AL
MO
IL
TX
OK
AR
IN
State

Figure 3

Title V: Appalachian Region Forest Use



* Kentucky reported loss of at least 250,000 acres of woodlands

Figure 4

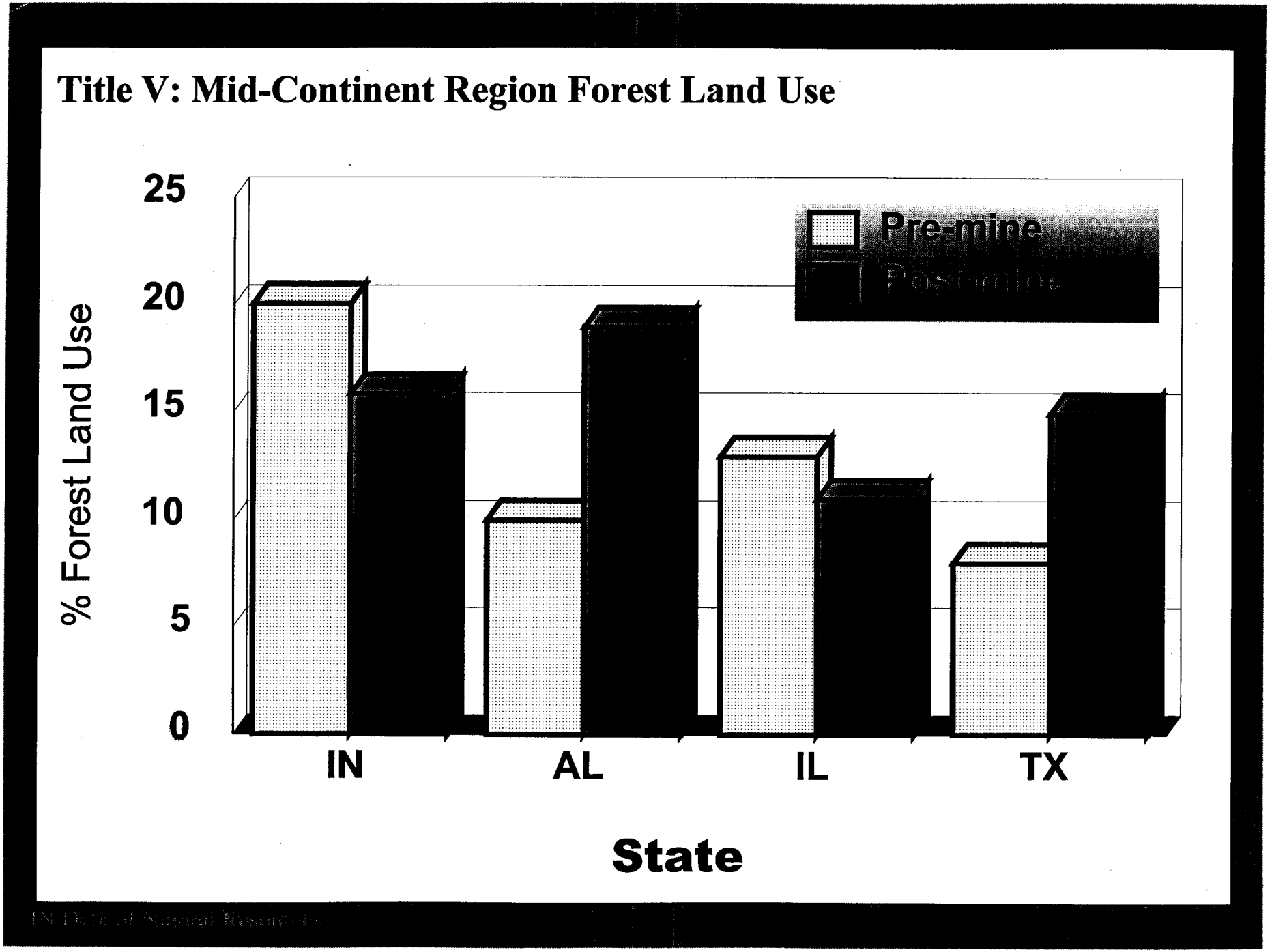

Title V: Mid-Continent Region Forest Land Use
25
20
15
10
5
0
% Forest Land Use
Pre-mine
Post-mine
IN
AL
IL
TX
State

Figure 5

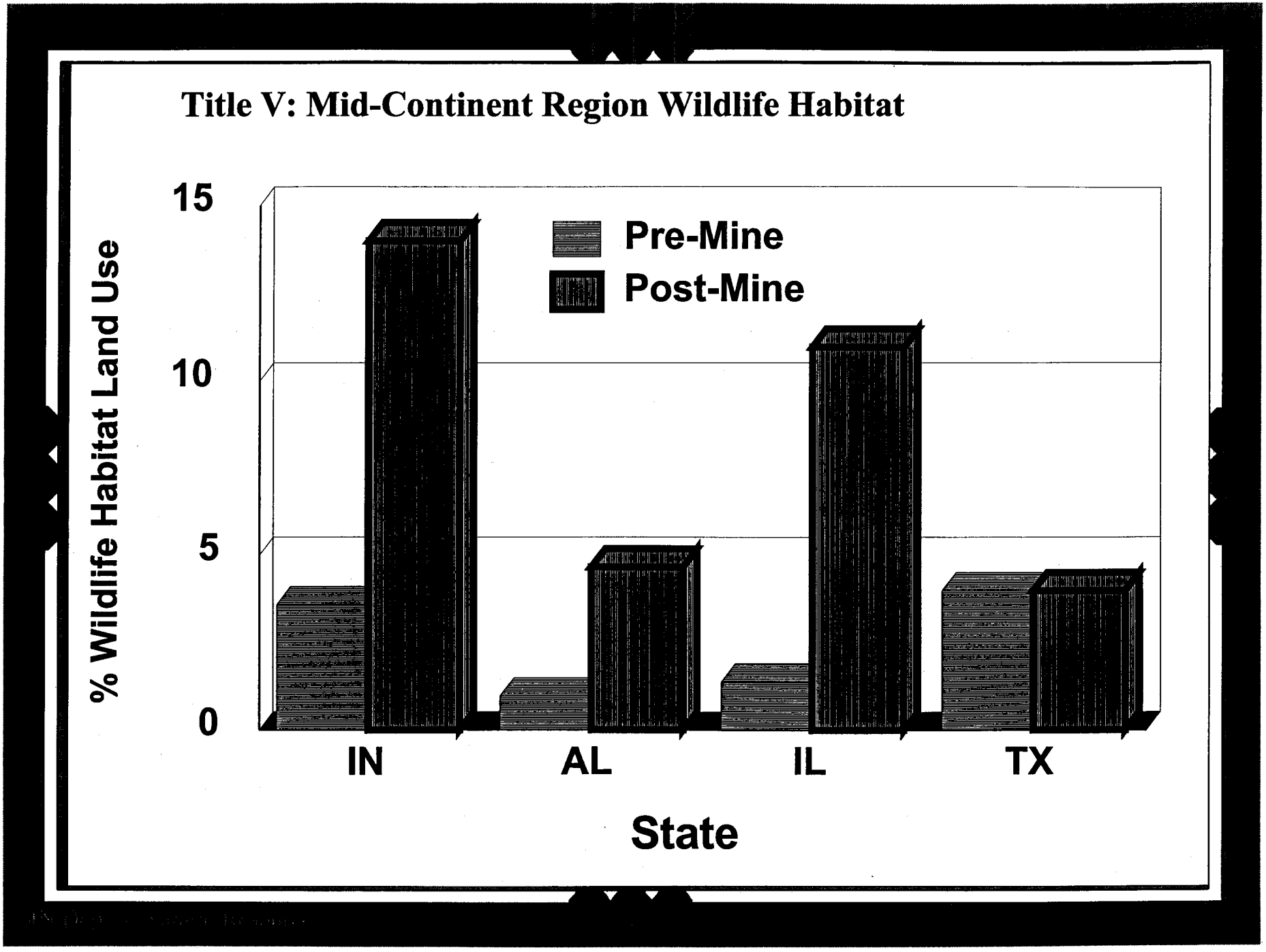

Title V: Mid-Continent Region Wildlife Habitat
% Wildlife Habitat Land Use
15
10
5
0
Pre-Mine
Post-Mine
IN
AL
IL
TX
State

Figure 6

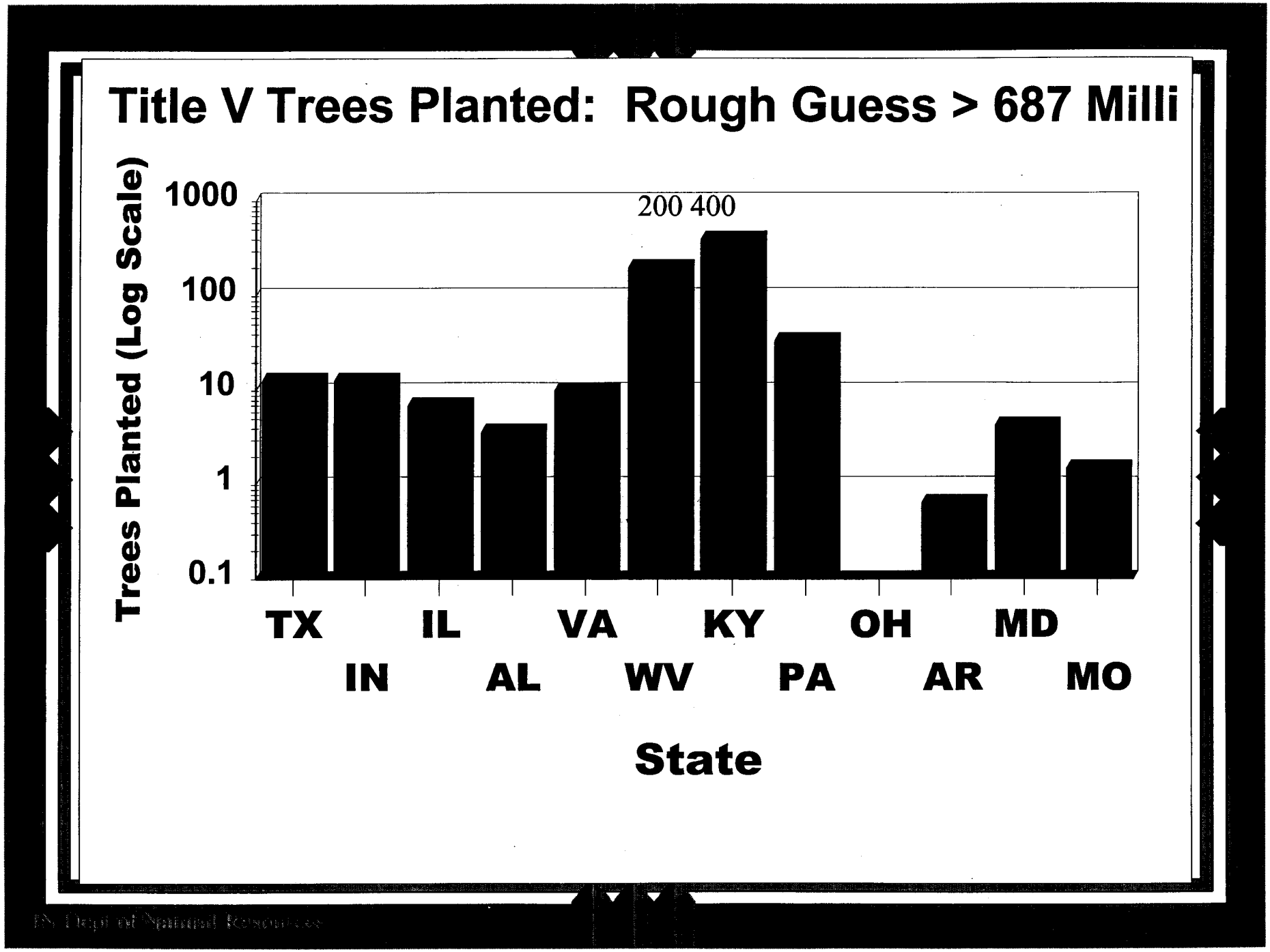

Title V Trees Planted: Rough Guess > 687 Milli
Trees Planted (Log Scale)
1000
100
10
1
0.1
200 400
TX
IL
VA
KY
OH
MD
IN
AL
WV
PA
AR
MO
State

Figure 7

STATE STATISTICS ON WESTERN U.S. TREE PLANTING EFFORTS

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Introduction

When it comes to the coal mining regions of the West, forestry is really not a predominate land use or ecotype, with the exception of the state of Washington which is a federal program state. Currently, in the western states, the areas that are being mined are primarily range land with some woody shrubs. The only trees that you find are usually along water courses and in sheltered areas that we would consider to be wildlife habitat. We have had a significant problem related to the establishment of woody shrubs. These problems relate to climatic conditions and costs. The cost to replace shrubs is extremely high, usually around $1,000 per acre. We also face the problem of landowners who do not want shrubs reestablished. It is not unusual to spend a lot of time, money, and effort to reestablish shrubs on reclaimed areas and then have the landowner remove them after bond release. Most of the landowners in the West focus exclusively on vegetation that can be eaten by livestock.

Efforts on Abandoned Mine Lands

We do a lot of work on abandoned mine lands (AML) resulting from hard rock mining that usually occurred in the higher elevations that are forested. We have worked hard to reestablish trees on many of these high altitude AML sites where it makes sense. One of the biggest impediments to reforestation with trees in the West is due, not so much to the regulations as with constraints placed on the funds we receive for reclaiming abandoned mine lands. If we are able to start spending AML funds in the West to enhance the environment through revegetation, then I think we can begin to do more with reforestation in the higher elevations. We hope to discuss this more in the near future with the director of OSM. Currently, the priorities for these AML funds limit us to applications that focus on health and safety.

Active Mining Efforts

North Dakota is the leader in planting trees on active mine sites. They have established about 220,000 trees, which is a lot of trees for North Dakota. These are planted primarily along water courses and in wind breaks as wildlife habitat. Alaska has planted about 5,000 trees per year in both their active and AML programs for wildlife habitat. In Colorado, we are planting about 3,800 trees per year, mostly on forfeited bond sites and in the AML program. Utah has been replacing about 1,800 trees per year. In Wyoming, they are replacing primarily grasses and shrubs because that was the premining vegetation.

Summary

The opportunity for encouraging reforestation in the West really lies in the AML program. In terms of the active mining, it is a matter of encouraging the companies to reestablish the trees that were there prior to mining. This would include shelter areas for wildlife and along the water courses such as the cottonwood gallery forest. I do think we have a big education process that must be done for landowners. If there is an opportunity in the West, it may be in AML and where mining occurs on federal land. We should talk to the federal agencies that work with the coal mines on federal lands concerning their ideas for postmining land use where it is climatically and economically possible and beneficial to plant trees. We are supportive of OSM's initiative to encourage reforestation. We are now trying to determine what our role is in the process. We do want to look at ways that we can improve our reforestation efforts in the future. We are looking for ways to find research funds and additional AML funds to increase our tree planting efforts and success.

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OFFICE OF SURFACE MINING (OSM)
REVEGETATION TEAM SURVEY RESULTS

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Background

On May 13, 1998, OSM headquarters held a planning session entitled Reforestation of Mined Lands and Carbon Emission Offsets. I left that planning session with the sense that a lot of land that should be returned to forestry for a whole host of reasons, only one of which was carbon sequestration, was not being planted to trees.

The OSM Revegetation Team met the next day as part of the planning for the Reforestation at Surface Coal Mines: Policy Outreach Symposium, which was held in Washington, D.C. on January 14, 1999. The OSM Revegetation Team is a group of six individuals within OSM who have met over a number of years to address issues associated with revegetation. In the meeting, we considered the question of what OSM needed to do to encourage reforestation of lands mined and reclaimed under Title V of the Surface Mining Control and Reclamation Act (SMCRA). It was our view that the low utilization of the forestry land use option following mining was primarily due to the way the Act was being implemented rather than being due to technical constraints. The fix, we felt, would in all likelihood require changes to policy, and perhaps regulations, of both OSM and the states. We also felt that industry mind set and culture, right down to the level of the dozer operator, was part of the problem. Given the prevalence of long standing practices and a "culture" of reclamation, some of it going back to before SMCRA, we felt that education would in all likelihood be part of the solution to the problem. We also recognized a tension between need to protect water quality in the short run and the longer view needed for the establishment of trees on mined land.

Another factor that we thought might play a role is the fact that some state regulations are "stricter" than federal regulations in that they still reflect the interim regulations requiring the elimination of gullies that are greater than 9 inches deep. Alternately, these regulations might be considered to be not as effective as the federal regulations in that they discourage forestry as a land use and encourage the production of an over compacted landscape stabilized with sod forming grasses and with reduced biological productivity compared to levels that potentially could be achieved. A search of COALEX indicated the following states have the gully rule in their regulations: Pennsylvania, Alabama, Kentucky, Mississippi, Illinois, Louisiana, Texas, Colorado, Montana, North Dakota; Maryland and Missouri have the rule with modifications attached.

The team also recognized that certain practical impediments to reforestation exist owing to the lack of readily available and appropriate planting materials, inherent risks from drought and animals (deer, mice), and competition from grasses required for erosion control.

The problem we faced, then, was to determine how to obtain creditable information that would confirm or refute our initial view and that would reflect on the factors affecting land use choice in the states.

OSM Reforestation Survey

Our solution was to request that the National Mining Association (NMA), the Interstate Mining Compact Commission (IMCC), and the Western Interstate Energy Board (WIEB) conduct a survey concerning certain reforestation information. On August 4, 1998, we sent a letter to NMA, IMCC, and WIEB requesting that they identify:

- impediments to planting trees under OSM and state regulations;

- regulatory or policy changes that would eliminate or offset these impediments;
- research that might offset the identified impediments; and
- incentives that would prove helpful in significantly increasing the use of forestry as a postmining land use.

We also asked these organizations to suggest state personnel who would be appropriate to be part of a team that will address the issues identified as a result of the questionnaire and to suggest industry contacts who would be willing to review and comment on team products. The reason for this peculiar structure lies in the Federal Advisory Committee Act which governs the interaction of the Federal Government and industry advisory groups.

Responses to the Reforestation Survey

Certain themes were clear in the responses to our questionnaire:

- Cost was clearly an issue affecting land use choice. It is probably worth noting that the regulations relating to land use and revegetation are unique among our regulations in that they provide a selection of performance standards from which the industry may choose. That is to the extent that the operator, working with the landowner, can determine the land use choice from among various land use/revegetation options that have different costs associated with them.
- Risk was also identified as a factor in land use choice. In the simple model, risk translates into potentially greater costs, and there is an obvious need for the coal industry to try to minimize both.
- Research, or lack of technology, was not considered to be part of the problem. However, based on information presented at the policy outreach symposium, I have modified my views on this subject as will be discussed later.
- Second guessing relates back to risk and cost again. One respondent clearly articulated the idea that industry prefers rules where the meaning is clear and not subject uncertain interpretations by the state regulatory authority or OSM. In light of this concern, the pastureland use is a clear first choice for many coal operators. But we are not dealing with a simple independent variable here; the possibility of second guessing translates into risk which affects potential costs.
- Nine inch gully rule. As mentioned earlier, enforcing this rule, which requires any gully greater that nine inches deep to be eliminated, would tend to discourage reforestation where development of large but stable gullies is more likely than in the pastureland use and fixing them is more difficult.
- 80 - 60 rule. The requirement that at the time of bond release 80% of the woody vegetation be in place for 60% of the applicable minimum period of responsibility was seen as discouraging reforestation as it portends the possibility of delayed bond release. But again, repairing gullies and delaying bond release ultimately effect the cost of reclamation.

Observations After the Reforestation Symposium

My mind set before the policy outreach symposium was that reclamation before SMCRA often involved refore-station, but after the passage of SMCRA reclamation usually resulted in pasture. The frame of reference here is primarily appalachian and midwestern areas. After the symposium, I had to modify my view. The situation apparently varies widely by state. The qualitative information presented at the policy symposium indicates that a significant amount of mined land is being reforested in some states and very little in others. In Virginia, for example, 86 percent of the land mined since 1991 is reported to have been reclaimed to forest and in Maryland the figure is 70 percent of the land since 1988 (data submitted in response to our questionnaire). In Ohio, on the other hand, since the implementation of SMCRA , only one percent of the land has been returned to forest whereas 90

percent was forested before mining (Kaster, Gary and John P. Vimmerstedt, 1996). In West Virginia, a similar situation exists. A Forest Service inventory of the acreage of forest lost to mining (111,000 acres between 1989 and 1995) closely compares to the acres disturbed as recorded by OSM (Burger, James A. and William R. Maxey, 1998). One must view these numbers with a good bit of caution. Some represent best guesses that are taken on faith and others come from published materials. But it does seem safe to conclude that the situation varies widely from state to state.

A significant question before us relates to the quality of the reclaimed forest land. If there is one idea that came out of the policy symposium loud and clear it is that overcompaction of the rooting medium is the norm. But why is this the case? To some degree, I believe it relates to fundamental tensions in the Act.

There are tensions in SMCRA and its regulations that are germane to the issues at hand. An example of a tension in the regulations is the need to protect water quality and the need, or at least desire, to encourage reforestation. Sod-forming grasses can't be beat for stabilizing soil and preventing sedimentation problems. However, if one wants to establish trees, it is necessary to reduce the use of sod-forming grasses for erosion control and find either a more complex, more expensive, or higher risk method of preventing erosion. Programmatic overemphasis on erosion control (the term erosion appears 95 times in the federal regulations) may militate against forest as a land use choice. If we as regulators are going to "hammer the industry" for sediment violations, why should they choose a final land use that is likely to result in water quality violations or necessitate rill and gully repairs. I have heard the idea expressed that even pre- SMCRA emphasis on erosion control reduced tree planting. We apparently are dealing with fundamental tradeoffs here; you can't maximize erosion control in the short run and reforestation at the same time. Ironically, forests, once established, result in excellent erosion control and water quality.

There is another more fundamental tension in the act itself that I believe is very relevant to our desire to encourage reforestation. We are instructed in SMCRA to meet the energy needs of the nation and protect the environment (two instructions that may be in conflict). It appears that in order to meet energy needs we approve permits for operations that inevitably will result in overcompaction.

Consider the following:

> Sec. 515(b)(2) of the Act. — "restore the land affected to a condition capable of supporting the uses which it was capable of supporting prior to any mining, or higher or better uses of which there is reasonable likelihood"
> Sec. 102(d) of the Act — "assure that surface coal mining operations are so conducted as to protect the environment"
>
> Sec 102(f) of the Act — "assure that the coal supply essential to the Nation's energy requirements, and to its economic and social well-being, is provided and strike a balance between protection of the environment and agricultural productivity and the Nation's need for coal as an essential source of energy"

But, to the best of my knowledge, we never articulate how the balance is being struck!

As stated earlier, it was clear at the reforestation policy symposium that overcompaction is the norm on reforested land. It can be argued that overcompaction is part of the price we pay for balancing the need for energy production against protection of the environment within the context of currently available technology. Our unwritten policy apparently is that we allow overcompaction as a necessary price of coal production in today's world.

To the extent the above is true, the solution to the problem of overcompaction lies more in the realms of research than policy. Perhaps research along the lines of that currently going on in Kentucky is necessary to reduce the environmental impacts of the unstated compromise, where reduced grading may provide a key to cost effective production of forest land with a high site index.

But judging from discussions, both formal and informal, at the policy symposium, this is not the whole story. Other parts of the problem includes an operator culture that desires precise grading, lapses in management that

allow dozer operators to kill time while appearing productive through excessive grading, and simply failing to recognize that driving over recently replaced soil (rooting medium) with a scraper or truck in the process of replacing the topsoil is very damaging to the rooting medium and the future plant community.

I left the policy symposium with the impression that the percentage of land being returning to forest, where such is the appropriate land use, is greater than I anticipated, but that the quality of that land might prove to be unacceptable in the long run. Additionally, for the purposes of the symposium, we used a rather liberal definition of forest; a definition that included fish and wildlife land with woody vegetation. Thus, while it appears that a significant amount of mined land is being returned to forest in some states, it is not clear at this point whether or not all of this land should properly be classified as forest.

We came under criticism at the policy symposium for not considering productivity as a criteria for bond release of forest land. It is, after all, productivity that translates into board feet of lumber, tons of carbon sequestered, and dollars in the bank. Also, restoring the productivity of the land is necessary to fully meet the requirements of Sec. 515(b)(2) of the Act, i.e., "restore the land affected to a condition capable of supporting the uses which it was capable of supporting prior to any mining." I was curious how the authors of our regulations viewed the subject of productivity. While I was not able to research the subject in depth, a quick look at the preamble to the 1979 Permanent Regulatory Program (44 FR 14902, 15241, March 13, 1979) offers an interesting insight into what the authors of the regulations intended to accomplish. In response to a commenter addressing reforestation, it is stated that "(t)he regulations have a self-regenerative requirement for vegetation and the operator is held liable until the regulatory authority is satisfied that the status required by the regulations is achieved. When this is achieved, as in successful reforestation activities, the vegetation will continue to increase and the former biomass will be achieved in the future." At the present time, this looks like wishful thinking. But, the important point here is that appar-ently the authors of the revegetation regulations thought they were drafting regulations that would result in productive forests.

If indeed the regulations are not producing the desired result, perhaps they should be revised. Torbert et al. (1994), in a project funded by OSM, proposed a "white pine bioassay" as a way of evaluating the productivity of reclaimed forest lands. In the proposed test, the annual growth of young white pines, at least 25 per acre, planted as part of the tree crop or for test purposes, would be used to predict the site index of the reclaimed land. Another approach to overcompaction and the resultant low forest productivity, might be to frame the regulations in terms of rooting media design standards and stocking specifications. The design standards would address how the top four feet of material is placed, and the stocking standards would continue to specify the number of live stems per acre required for bond release. The idea here is that appropriate design standards, if enforced, would result in a superior growth medium compared to what is currently being produced. In this case, the design standard and performance standard address variables that are, in a practical sense, independent. Thus, we avoid the undesirable situation of requiring the industry both to do something in a particular way and to obtain a particular result.

The concern was expressed at the policy symposium that allowing rough grading of spoil material, as a way of improving reclaimed forest land, might be used as a tool by the coal industry to avoid reclaiming the agricultural capability of the land in the Midwest. This does not appear to be an idle concern, but reflects political pressures that currently exist in at least one state. I believe this concern deserves our attention. Sec. 515(b)(2) of the Act makes a clear statement of the requirement to reclaim "the uses which it (the land) was capable of supporting prior to any mining." Reduced grading and planting with trees in the Appalachian environment is clearly an effort to reclaim the land use capability that is not currently being reestablished. Applying such an approach in the Midwest, where typically arable soils exist before mining, would fly in the face of the requirement of Sec. 515(b) (2). But, from a legal perspective, just how vulnerable to challenge are the regulations aimed at reclaiming the multiple capabilities of the land? My sense is that, if logic prevails, deep productive soils that provide multiple land use capabilities cannot be replaced with overburden that is capable of supporting tree growth but which is of limited utility for supporting agricultural production. OSM articulated a position in its approval of an Ohio Regulatory Program Amendment addressing undeveloped land which I believe has relevance here (59 FR 22507, 22514, May 2, 1994). In that rule, the requirement for reclamation of the uses the land was capable of supporting before mining is separated from the revegetation standards. The document states "section 508(a) of SMCRA and its legislative history (S. Rep. No. 128, 95th Cong., 1st Sess. 77 [1977]), provide that the demonstration that

premining capability can and will be restored must be made as part of the reclamation plan submitted with the permit application. Thus, the land use restoration requirements of section 515(b)(2) are addressed primarily through the permit application review process, and compliance is achieved by adherence to the reclamation plan and other performance standards such as those pertaining to toxic materials, topsoil, and backfilling and grading."

Given that the Act at Sec. 515(b)(2) requires that the uses (plural) that the land was capable of supporting prior to mining are to be restored, I find it difficult to understand how a mining and reclamation plan could be approved that significantly reduced the agricultural capability of the land. Unfortunately, countering this argument is the realization that arable land in the Midwest has often been reclaimed to pasture that is no longer arable. Is this reduction in land use capability part of the unstated compromise to allow coal mining to occur? Once again, I don't know the answer, but experience indicates that we cannot categorically deny the possibility that forests would be established on reclaimed land which has significantly reduced capability compared to the premined land. Ultimately, protection of the agricultural resource requires an ongoing commitment to that end and the political will to make it happen.

Considerations for the Future

As we look to the future and try to facilitate reforestation where it is appropriate, I think there are some questions we as regulators need to ask ourselves:

- How much of the overcompaction we accept today is necessary to allow mining to occur and how much represents regulatory failure?

- Does our failure to directly address the productivity of reclaimed forest lands represent a regulatory failure?

- Maybe there are other approaches to regulation that we should consider, e.g., design standards for the replacement of the top four feet of material.

- Maybe we simply need to enforce existing soil handling regulations. 30 CFR 816.22 requires that soil substitutes be the best available in the permit area to support vegetation and that excess compaction be prevented. My impression is that we give little attention to selective overburden handling beyond that required to keep toxic materials out of the surface, and it is clear that we allow excessive compaction to occur.

- And, the ultimate question, do we have to revise the regulations to encourage reforestation in order to improve the quality of the reclaimed forests, or can adequate improvement be achieved through policy initiatives and research?

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[1]Dr. Boyce holds a B.S. in Agriculture from Rutgers University, and an M.S. and Ph.D. from the University of Nebraska. He has worked as an Agronomist or Soil Scientist for a number of Interior agencies, including the Bureau of Land Management, the Minerals Management Service, and the U.S. Geological Survey. Dr. Boyce has been with OSM for 14 years.

SUMMARY REPORT ON STATE REFORESTATION AND TREE PLANTING STATISTICS

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Herndon, Virginia

Introduction

On November 23, 1998, in anticipation of the Office of Surface Mining's (OSM) Policy Outreach Symposium on Reforestation at Surface Coal Mines on January 14, 1999, the Interstate Mining Compact Commission (IMCC) distributed a survey to all coal-producing states seeking information and statistics on state reforestation and tree planting efforts. A request for supplemental information was sent to these same states on February 1. As of March 15, 1999, 21 states had responded to the survey. A copy of the survey and a summary of the responses (by OSM region) are attached to this report. Of the 21 states that responded, several provided reforestation and tree planting information for both their Title IV (Abandoned Mine Lands) and Title V (active mining) regulatory programs, including Ohio, Virginia, Arizona, New Mexico, Utah, Iowa, Illinois, Indiana, Kentucky, Maryland, Missouri, Pennsylvania, West Virginia, Colorado, Arkansas, and Wyoming. Other states provided separate reports for each program area, including Alabama, Texas, and North Dakota. Two states, Oklahoma and Tennessee, provided information for only their Title IV AML programs. An analysis by OSM region of the responses to the survey follows.

Western Region

It will come as no surprise, given the geographic and climatic conditions of the arid West, that tree planting and reforestation efforts are quite minimal. Any tree planting that does occur is usually done in conjunction with a wind erosion control plan or as a wind breaking technique associated with farmsteads. Any woodlands that are created are usually part of a wildlife habitat enhancement project, not as commercial forest land. Most of the active mining areas in the West are classified as grazing land/wildlife habitat and consist of dry grassland and low shrubs. The same is true of abandoned mine land areas, where trees may be selectively placed for diversity as part of a wildlife habitat enhancement plan.

Those western states that responded to the survey indicated that they would endorse appropriate initiatives to enhance reforestation efforts on reclaimed lands for both Title IV and V programs. However, there was concern about lessening reclamation standards or environmental protection; demonstrating that the post-mining land use makes sense; and assuring surface owner consent for additional tree plantings.

Among the various initiatives that attracted the most interest from the western states were appropriate rule changes, technology exchange, education of landowners, and awards or recognition programs.

In terms of actual tree plantings, a total of 215,000 trees were reported planted at active mining sites in the region; a total of 22,000 trees were planted on Title IV sites.

Mid-Continent Region

Although the states reporting for the Mid-Continent Region did not show significant percentages of forest land as a postmining land use (the average being about 18 percent), the actual number of tree plantings is encouraging. This is especially true in those instances where tree plantings occur as part of a wildlife habitat enhancement program. The quality of the forest land was reported as medium to high for most states. Percentages of abandoned mine land reclaimed to forest is generally in the 5 to10 percent range, except for Alabama, where remarkable progress has

been made. In terms of the relative cost of planting trees in comparison to other postmining revegetation efforts, trees typically cost more, in some instances up to 50 percent more.

The mid-continent states generally endorse initiatives to enhance reforestation efforts, but with several caveats. There is a universal concern that any enhancement efforts not reduce the quality of reclamation under the banner of a reforestation initiative. This is particularly true in the areas of soil capability standards, compaction require-ments, and soil resources. States expressed concern about reforestation initiatives reducing the capability of the land to support the same or similar land uses that existed prior to mining. Landowner support for increased tree planting was also identified as potentially problematic. On the AML side, there was universal agreement that the best enhancement for increased tree planting at AML projects was more AML money being allocated to the states from the AML Trust Fund. Landowner buy-in also was cited as a concern at AML sites.

In terms of the initiatives with the most promise, the mid-continent states supported policy/guidance changes and enhancements, particularly in the area of fish and wildlife habitat; regulation/rule changes; and education of land-owners and the public regarding the benefits of planting trees. This latter initiative was prevalent throughout the survey responses.

Actual tree plantings were remarkable for the Mid-Continent Region. A total of 20 million trees have been planted at active mining sites, mostly over the past three to five years. On the AML sites, 7,798,300 trees have been planted, with 6.6 million being planted in Alabama alone.

Appalachian Region

The average percentage of forest land as a postmining land use is the highest in the Appalachian Region, approximately 50 percent. Virginia was the highest at 86 percent. The appalachian states also reported the highest percentage of abandoned mine land being reclaimed to forest, an average of 60 percent. Interestingly, the relative cost of planting trees in Appalachia is the lowest in the country, averaging $250 per acre (although these figures may refer to incremental costs for planting trees).

With regard to initiatives to enhance reforestation efforts, the eastern states endorse such initiatives as long as they do not undermine existing regulatory requirements. One state, Maryland, actually requires trees and shrubs to be planted on all reclaimed areas. On the AML side, while states supported various initiatives to increase tree planting, they expressed concern about adequately resolving landowner desires. And in terms of those initiatives that received the most interest from the eastern states, policy/guidance changes or enhancement, technology exchange, education of landowners, and research topped the list.

Finally, tree planting efforts in the east were very encouraging. A total of 33.8 million trees were planted on actives sites over the past several years in Pennsylvania alone. Maryland has planted 4,273,000 trees on some 9,449 acres since 1943. On the AML side, 13,744,000 trees were planted throughout the region. Significant tree plantings on active sites (in the 100 million range) are likely in both Kentucky and Virginia.

Conclusion

The states have demonstrated a commitment to the planting of trees on both active and AML sites where it is possible to do so from a geographic and climatic perspective. Tree planting efforts have been remarkable, with at least 57 million trees having been planted on active sites over the past several years, and another 22 million trees having been planted on AML sites. These numbers do not reflect the significant tree plantings that have likely occurred at active mining sites in Ohio, Kentucky, and Virginia. The latter three states could easily account for another 300 million trees, based on estimates provided by academia and landholding companies. The states generally support initiatives to enhance reforestation efforts, as long as environmental protection and land use capability are not sacrificed or undermined. Perhaps the two most promising incentives to encourage tree planting are education of landowners and the public about the value of trees and appropriate policy and/or guidance changes that would clarify certain regulatory requirements such as wildlife habitat as a postmining land use and limitations

of the extended liability period where replanting occurs. For AML sites, a key element is increased funding for

state AML projects.

It is likely that we will see continued efforts by the states to encourage the planting of trees at active and AML sites in the future. As long as this can be done in an environmentally sensitive manner, everyone will win.

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SUMMARY OF REFORESTATION SURVEY RESULTS — MID-CONTINENT REGION

1. Pre/post mining land uses — (see attached tables)

2. Quality of reclaimed forest land:
   Arizona, Missouri, Texas — Medium
   Alabama, Alabama-AML — High
   Indiana — Unknown; survival is good; however, productivity is estimated to be low to medium based upon visual observations and site conditions that have thin or compacted soils.

3. Percentage of pasture that is abandoned post bond release:
   Alabama — 0%
   Alabama-AML — 0%
   Arkansas — 14%
   Illinois — 5%
   Indiana — 5%
   Missouri — unknown

4. Percentage of abandoned mine land under Title IV of SMCRA that was reclaimed to forest:
   Alabama-AML — 90%
   Arkansas — 8% (does not include wildlife shelter belts along drainage ditches)
   Illinois — 25% (161 acres)
   Indiana — 5 - 10%
   Missouri — 5%
   Oklahoma — Less than 1%
   Texas — 37% (720 acres)

5. If information is available, please relate the relative cost of planting trees in comparison with other postmining land uses in your state. (NOTE: Some of the following figures may refer to the incremental cost of planting trees, not the total revegetation/reclamation cost.)
   Alabama — Trees = $740 per acre; pasture = $640 per acre; undeveloped = $640 per acre
   Alabama-AML — $252 per acre (cost of trees and labor to plant)
   Arkansas — Less expensive than pasture due to less preparation and maintenance.
   Indiana — $1400 per acre for trees; $700 per acre for grasses.
   Missouri — Trees are more expensive than pasture but initially are less expensive than native grasses for wildlife habitat.
   Texas — Tree planting is more expensive by about 50%.

6. With regard to initiatives to enhance reforestation efforts on reclaimed lands as part of the Title V regulatory program, our state:
   Strongly endorses such initiatives: Alabama; Alabama-AML
   Endorses such initiatives with qualifications:
   Arizona — Concern about OSM efforts to abridge Arkansas' authority to plant conifers (i.e., shortleaf pine or loblolly pine) in a guise to subvert commercial monoculture. Also, would not want to see significant changes to recent forestry guidelines.
   Illinois — We are concerned that there could be efforts to use this initiative to do away with soil capability standards.

   Indiana — The premining capability of the land to support a variety of uses must be maintained by restoration of thick uncompacted soil layers. Soil resources should not be destroyed nor should inferior reclamation practices be allowed as an encouragement

of tree planting. We are leery that this initiative, as applied to our state, could be used as a platform to reduce the quality of reclamation under the banner of reforestation and to undermine currently pending court cases.

Missouri — Landowner must be committed to maintain reforested land approved in the permit application and not mow the trees down after final reclamation bond release in an attempt to convert the property to "more productive use."

Texas — Concerned about dealing with landowner preferences; concerned about land being reclaimed to a lower standard not capable of supporting land uses that existed before mining. Need to assure appropriate reconstruction of postmined soils.

7. With regard to initiatives to enhance reforestation efforts on reclaimed lands as part of the Title IV AML program, our state:

Strongly endorses such initiatives: Indiana, Alabama, Alabama-AML. However, this is dependent upon increased AML moneys to fund such initiatives.

Endorses such initiatives with qualifications:

Arizona — Trees are generally planted at the invitation of the landowner or when it is prudent to do so.

Missouri — Education of landowners regarding reforestation is essential. Also, need more AML moneys. Finally, OSM needs to endorse effective tree planting on priority three AML lands to promote reforestation and improve wildlife habitat.

Has some interest in such initiatives: Oklahoma; Texas (concerned about need for more AML moneys and landowner preferences).

8. What types of initiatives would you support (please mark in order of priority/preference with "1" being most important). The following numbers reflect the various "ranks" listed by the states with respect to such initiatives.

Actual Ranking	Average Ranking	Initiative
1/7/3/7/1/1/7	3.6	Policy/guidance changes or enhancements
2/3/7/4/3	3.8	Technology exchange
4/4/1/2/6	4.0	Financial assistance for regulatory authorities or coal operators
3/6/8/6/1/1	4.2	Education (landowners, public, etc.)
5/5/5/8/2/2	4.5	Generating more data to support any particular initiative
4/2/9/5/4	4.8	Research
9/2/2/8	5.3	Regulation/rule changes
9/3/1/3	5.3	Statutory changes
1/6/9/5	7.0	Awards or recognition programs

9. If available, please provide statistics, estimates, etc., regarding the number of trees planted on reclaimed sites over the past several years in your state. In doing so, please differentiate between Title V and Title IV sites.

Alabama — AML: 6.6 million trees on reclaimed AML sites; Title V: 3,700,000 trees over last three planting seasons.

Arizona — Title IV: 154 acres with 69,300 seedlings at a cost of $7,561.40; Title V: 108 acres at approximately 600 trees per acre.

Illinois — Title IV: 93,250 trees; Title V: 50,000 trees.

Indiana — Orders to the state forester from the state nursery amount to about one million trees per year for mined land reclamation.

Iowa — AML: 20,322 trees; Title V: 37,000 trees.

Missouri — Title V: 1,545,000 trees from 1990 to present; Title IV: since 1984, approximately one

million seedlings planted on AML lands.
Oklahoma — Trees are planted occasionally for wildlife habitat at AML sites.
Texas — Title IV: 129,000 trees; Title V: 13 million trees.

Pre/Postmining Land Uses — MidContinent Region									
State	Percentage Forest[1]		Percentage Pasture		Percentage Wildlife		Percentage Other		Notes
	Premining	Postmining	Premining	Postmining	Premining	Postmining	Premining	Postmining	
Alabama	10	19	5	13	1	5	84	63	
AL AML		90		8				2	
Arkansas	23	4	38	79			39	17	
Illinois	13	11	19	34	2	12	66	43	
Indiana[2]	20.1	15.9	13.5	23.3	3.6	14	62.8	46.8	1982 - Present
Indiana (1982 - 1990)	18.6	12.8	16.8	39.8	2.3	10.6	59.3	36.8	
Indiana (1990 - 1998)	23.1	22.1	7.1	8.7	5.4	20.5	64.4	48.7	
Missouri[3]	34	19	28	43			38	38	
Texas	8	15; AML-37	70	60; AML-53	4	4	18	21	

[1]All percentages based on best estimates, except for Alabama-AML and Texas-AML, which are based on actual data.

[2]In Indiana, the primary value of most woodlands is as wildlife habitat. In order to encourage tree planting and mitigation of fish and wildlife habitat impacts, much forest is allowed to be converted to wildlife habitat postmining land use which requires 250 stems/acre for bond release as opposed to 450 stems/acre for forest land use. When the program began in 1982 until 1990 fish and wildlife habitat mitigation and land use balancing was not a priority. In 1990, the Natural Resources Commission required greater mitigation of fish and wildlife habitat. The first listing of numbers reflects total acreage figures for the program, 1982 to present. The second set of numbers shows changes that occurred beginning in 1990 and the progress that has been made since that time in replacing forest and wildlife habitat.

[3]In Missouri, trees generally are planted to support wildlife habitat (225 stems per acre), not for timber production.

SUMMARY OF REFORESTATION SURVEY RESULTS — WESTERN REGION

1. Pre/postmining land uses — (see attached table)

2. Quality of reclaimed forest land:
   North Dakota — Medium

3. Percentage of pasture that is abandoned post bond release:
   North Dakota — 0%

4. Percentage of abandoned mine land under Title IV of SMCRA that was reclaimed to forest:
   Arkansas — 0%
   Colorado — 0%
   Wyoming — less than 1%

5. If information is available, please relate the relative cost of planting trees in comparison with other postmining land uses in your state.
   Colorado — 40% higher

6. With regard to initiatives to enhance reforestation efforts on reclaimed lands as part of the Title V regulatory program, our state:
   Endorses such initiatives with qualifications:
   Colorado — Any reforestation effort must not result in the lessening of reclamation standards or environmental protection and must demonstrate a postmining land use that makes sense. Reforestation should not be done just to satisfy some "initiative."
   North Dakota — Surface owners need to agree to additional tree plantings.
   Has some interest in such initiatives: Arkansas

7. With regard to initiatives to enhance reforestation efforts on reclaimed lands as part of the Title IV AML program, our state:
   Strongly endorses such initiatives: North Dakota
   Has some interest in such initiatives: Arkansas, Colorado

8. What types of initiatives would you support (please mark in order of priority/preference with "1" being most important). The following numbers reflect the various "ranks" listed by the states with respect to such initiatives.

Actual Ranking	Average Ranking	Initiative
2/3/2	2.3	Education (landowners, public, etc.)
1/4/3	2.7	Technology exchange
1/5	3.0	Awards or recognition programs
3/4	3.5	Research
6/2	4.0	Policy/guidance changes or enhancements
7/1	4.0	Financial assistance for regulatory authorities or coal operators
4	4.0	Generating more data to support any particular initiative
8/1	4.5	Regulation/rule changes
9	9.0	Statutory changes

9. If available, please provide statistics, estimates, etc., regarding the number of trees planted on reclaimed sites

over the past several years in your state. In doing so, please differentiate between Title V and Title IV sites.

Arkansas — Title IV: 5,000 seedlings (willow, birch, cottonwood) annually in 1997 and 1998. Seed (willow, birch, cottonwood, aspen) hand-cast over 60 acres. Intended land use = wildlife habitat and recreation. Title V: 7,000 seedlings (alder, white spruce, willow) planted on reclaimed sites in 1998. Land use = wildlife habitat.

Colorado — Approximately 3,800 trees planted at a Title V bond forfeiture site; approximately 4,000 trees planted at five Title IVsites over 12 years.

North Dakota — Approximately 220,000 trees planted (primarily for windbreaks) since 1980.

New Mexico — Title IV: Limited by geography and climate. Trees used have included juniper, pinon, sagebrush, salt bush, mahogany, oak, sumac and locust. About 1,000 trees planted. Title V: All sites located on arid lands; when seedlings have been planted, elk tend to eat them.

Utah — 1,800 trees (aspen, cottonwood, white pine, spruce, and fir) and 4,000 small trees or shrubs (gamble oak, mahogany, choke cherry) have been planted.

Pre/Postmining Land Uses — Western Region							
State	Percentage Forest[1]		Percentage Pasture		Percentage Other		Notes
	Premining	Postmining	Premining	Postmining	Premining	Postmining	
Alaska	0	0	0	0	100	100	
Colorado	1	0	4	4	95	96	
North Dakota[2]	2	2	25; AML - 20	20; AML - 30	73; AML - 80	78; AML - 70	
Wyoming					100	100	Grazing; wildlife habitat

[1]All percentages are based on best estimates.

[2]In North Dakota, mining companies are generally requested to provide acreage for natural woodlands and man-planted shelterbelts (for wind erosion or windbreaks).

SUMMARY OF REFORESTATION SURVEY RESULTS — APPALACHIAN REGION

1. Pre/postmining land uses (see attached table)

2. Quality of reclaimed forest land:
   Low — Ohio, Kentucky, Tennessee
   Medium — Pennsylvania, Maryland, West Virginia, Virginia

3. Percentage of pasture that is abandoned post bond release:
   Ohio — 60%
   Maryland — 90%
   Pennsylvania — could be as high as 80%
   West Virginia — 10%

4. Percentage of abandoned mine land under Title IV of SMCRA that was reclaimed to forest:
   Kentucky — 60 - 75% (2,242 acres)
   Maryland — 22% (108 acres)
   Ohio — 30%
   Pennsylvania — 24% (6,000 acres)
   Tennessee — 80% (1,561 acres)
   West Virginia — 1%
   Virginia — 60% (500 acres)

5. If information is available, please relate the relative cost of planting trees in comparison with other postmining land uses in your state. (NOTE: Some of the following figures may refer to the incremental cost of planting trees, not the total revegetation/reclamation cost.)
   Kentucky — $200/acre for trees
   Maryland — $250/acre for trees; $650 - 800/acre for grasses and legumes
   Pennsylvania — $250/acre for trees
   Tennessee — $270/acre + labor
   Virginia — $120 per acre increase

6. With regard to initiatives to enhance reforestation efforts on reclaimed lands as part of the Title V regulatory program, our state:
   Strongly endorses such initiatives: Kentucky, Maryland
   Endorses such initiatives with qualifications:
      Ohio — The initiatives should not be used to undermine existing regulatory requirements.
      Pennsylvania — Regulatory standards such as alternative soil conservation and replacement should not be considered. Other regulatory standards could be reduced (e.g., eliminating the requirement that extends the five year liability period when replanting trees). Also, landowner concerns must be addressed.
      Maryland — The State Land Reclamation Committee generally requires trees and shrubs to be planted on all reclaimed areas exceeding 12 degrees or 22 percent slope.

7. With regard to initiatives to enhance reforestation efforts on reclaimed lands as part of the Title IV AML program, our state:
   Strongly endorses such initiatives: Ohio, Tennessee
   Endorses such initiatives with qualifications:
      Maryland — Need to accommodate landowners' desires.
      Pennsylvania — Need for more AML moneys; landowner concerns need to be resolved.

Virginia — The type of AML project, landowner wishes, and adjacent land uses often direct revegetation options.

8. What types of initiatives would you support (please mark in order of priority/preference with "1" being most important). The following numbers reflect the various "ranks" listed by the states with respect to such initiatives.

Actual Ranking	Average Ranking	Initiative
1/5/1/2/3	2.4	Policy/guidance changes or enhancements
3/2/4/3/6/1	3.2	Education (landowners, public, etc.)
2/3/7/23.5	3.5	Technology exchange
5/1/3/4/5	3.6	Regulation/rule changes
8/4/5/1/2	4.0	Research
4/6/6/1/9/4	5.0	Financial assistance for regulatory authorities or coal operators
9/7/2/4	5.5	Statutory changes
5/9/8/8/3	6.6	Awards or recognition programs
6/8/9/7	7.5	Generating more data to support any particular initiative

9. If available, please provide statistics, estimates, etc., regarding the number of trees planted on reclaimed sites over the past several years in your state. In doing so, please differentiate between Title V and Title IV sites.

Kentucky — AML: 923,060 trees from 1990 - 1998 covering 2,242 acres; bond forfeiture sites: 798,804 trees from 1990 - 1998 covering 2,843 acres.

Maryland — Total acres planted to trees from 1943 to 1997: 9,449; Title V: 4,273,000 trees since 1978; Title IV: 81,000 trees on 108 acres.

Ohio — Title IV: From 1981 - 1991, 2,360,245 trees on 1,612 acres; 5 million trees since 1991; Title V: not available.

Pennsylvania — 33.8 million tree seedlings have been planted on Title V sites since 1980; AML: 3 million trees.

Tennessee — AML: from 1996 - 1998, 1,561,000 trees

Virginia — Title IV sites: 5,000 trees per year average for past four years.

Pre/Postmining Land Uses — Appalachian Region							
State	Percentage Forest[1]		Percentage Pasture		Percentage Other		Notes
	Premining	Postmining	Premining	Postmining	Premining	Postmining	
Kentucky	48	38	6	17	46	45	
Maryland	36	24	26	45	38	31	
Ohio	40	5	30	70	30	25	
Pennsylvania	65	50	20	30	15	20	
West Virginia	70	60	25	30	5	10	
Virginia	82	86	2	11	16	3	

[1]All percentages based on best estimates, except for KY, MD and VA, which are based on actual data.